



Stormwater BMPs at IEUA's LEED™ Platinum Headquarters

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IEUA Headquarters Project

Phase I

- Total Site Acreage:
35 acres
- H.Q. Acreage - 14
acres
- Two 33,000 s.f.
buildings



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L.E.E.D.:

An Integrated Approach to the Design, Construction, and Operation of New Buildings

- J Electricity consumption
- J Potable water use
- J Stormwater infiltration and control
- J Raw material usage (recycled products)
- J Construction activities
- J Indoor Environmental/Air Quality

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Internal LEED concerns:

- J no contractors would bid – LEED too new
- J costs would be prohibitive
- J recycled materials would fall apart
- J skylights would leak
- J carpet tiles would ravel
- J paints would peel
- J construction schedule would be missed
- J stormwater won't perk – mosquito farm
- J foundation will be ruined
- J gophers will eat the drip irrigation
- J "cool roof" material too new

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The Headquarters Building RFP

- J D/B – time was of the essence
- J LEED Conference: ‘To have a successful project you need to get the Contractor on board’
- J Established three bid prices (base, gold, and platinum)
- J Matrix of points provided flexibility for Contractor/Architect to select building elements to design and construct
- J LD’s and Incentives associated with LEED activities and schedule

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Why LEED Made \$ense to us in 2001...

- J We produce recycled water – it is our ‘product’!
- J MWD’s message: “60% of potable water consumed is outside”
- J We generate waste heat – We had a \$2.1 million DOE grant...
- J In the middle of an energy crisis -design a bldg consuming the least amount of energy possible (lighting, etc.)
- J Evaluating stormwater infrastructure can potentially save money

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LEED 'Extras' – Providing Regional Leadership in 2001

- J Recycled materials (carpets, partitions, furniture, etc.)
- J Low VOC paints, glues, etc.
- J PV
- J 'Cool' roof
- J Stormwater treatment
- J Porous concrete and other permeable pavements
- J Bus stop
- J Hybrid & electric vehicles

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Why We Were Successful: An Engineering Approach – Estimate Economic Benefits First

- J Addressed technical issues – held a stormwater charrette with experts
- J Hired an experienced Energy Consultant (CTG Energetics) to evaluate savings/lifecycle costs: *Photovoltaics (PV)*; *Absorption chillers*; *Lighting and skylights* - Energy savings could result in up to 60% better than Title 24 requirements
- J Compared typical costs for administration buildings across the Country - \$180 to \$280/ sf
- J Researched productivity claims and benefits –to quantify and put a value to it - Productivity can increase by 26% (1999 California Board for Energy Efficiency Program Report -CPUC funded)

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Why We Were Successful: Fully Coordinated Design-Build Team

- J Determine LEED Certification goals
- J Decide which points achievable
- J Decide who will be responsible
- J Establish comprehensive schedule

LEED Green Building Rating System v2.0										
Project Name: Inland Empire Utilities Agency - Design Build										
Credit ID	Credit Title	Available Credits	Platinum Points	Gold Points	Silver Points	Certified Points	Other Points	Other Points	Other Points	Other Points
TOTAL	Platinum 52 :: Gold 39 :: Silver 33 :: Certified 26	69	52	39	33	26				
LEGEND: Light Gray Background = Primary Credit; BLACK Background = Secondary or Optional Credit										
MATERIALS AND RESOURCES (MR)										
MR.P01	Storage and Collection of Recyclables	1	1							
MR.C01.1	Building Reuse, Maintain 75% of Existing Shell	1	1							
MR.C01.2	Building Reuse, Maintain 100% of Existing Shell	1	1							
MR.C01.3	Building Reuse, Maintain 100% of Existing Shell and 50% of Non-Shell	1	1							
MR.C02.1	Construction Waste Management, Salvage/Recycle 50%	1	1							
MR.C02.2	Construction Waste Management, Salvage/Recycle 75%	1	1							
MR.C03.1	Resource Reuse, Specify 5%	1	1							
MR.C03.2	Resource Reuse, Specify 10%	1	1							
MR.C04.1	Recycled Content, Specify 35%	1	1							
MR.C04.2	Recycled Content, Specify 50%	1	1							
MR.C05.1	Local/Regional Materials, 20% Manufactured Locally	1	1							
MR.C05.2	Local/Regional Materials, 50% Harvested/Extracted/Recovered Locally	1	1							
MR.C06	Rapidly Renewable Materials	1	1							
MR.C07	Certified Wood	1	1							
INDOOR ENVIRONMENTAL QUALITY (EQ)										
EQ.P01	Minimum IAQ Performance	1	1							
EQ.P02	Environmental Tobacco Smoke (ETS) Control	1	1							
EQ.C01	Carbon Dioxide (CO2) Monitoring	1	1							
EQ.C02	Increased Ventilation Effectiveness	1	1							
EQ.C03.1	Construction IAQ Management Plan, During Construction	1	1							
EQ.C03.2	Construction IAQ Management Plan, After Construction	1	1							
EQ.C04.1	Low-Emitting Materials, Adhesives and Sealants	1	1							
EQ.C04.2	Low-Emitting Materials, Paints	1	1							
EQ.C04.3	Low-Emitting Materials, Carpet	1	1							
EQ.C04.4	Low-Emitting Materials, Composite Wood	1	1							
EQ.C05	Indoor Chemical and Pollution Source Control	1	1							
EQ.C06.1	Controllability of Systems, Operable Windows	1	1							
EQ.C06.2	Controllability of Systems, Individual Controls	1	1							

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Why We Were Successful “Nothing Fancy”



- Tilt-up concrete (low technology) building type
- Off the shelf items/ standard sizes – nothing special made
- Most economical building envelope
- Panelized building system

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Why We Were Successful

Construction Phase Had a LEED Action Plan

- J Contractor/subcontractor pre-construction meetings
- J Keep *green material tracking sheets* current
- J Mid project audit of LEED progress
- J *Photographs*: required for USGBC submittal Submittal review for LEED conformance
- J Material staging and pre-installation approvals for green products
- J Continual worker education on LEED



Covered HVAC ducts in conformance with EQ credit 3.1.

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LEED Platinum Analysis Results

Capital costs

- J Saved over \$1.4 million on stormwater infrastructure

O&M costs

- J Saving hundreds of thousands on electricity costs annually

Life-cycle costs

- J Increased capital costs for energy related equipment for base bid versus Platinum bid -(115kW consumption during peak summer period)
- J Increased costs based on productivity increases result in a **3.3** year payback period (CPUC funded study).

Schedule

- J Platinum certification does not add time to the contract

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Stormwater At IEUA's HQ

- J Pervious Pavement
- J No Curb/Gutter
- J Bioswales
- J Detention Basin
- J Natural Drainage Systems
- J Roof Runoff Controls
- J Dry lake/pond via surface flow
- J Landscape Planning



Stormwater Element Design Objectives

- J Break even as it relates to costs
- J Build a BMP parking lot– implement what others have not been able to do (*LACDPW*)
- J Minimize stormwater runoff
- J Increase on-site infiltration and reduce contaminants flowing to Chino Creek
- J Meet U.S. Green Building Council 2.0 LEED™ manual's criteria for post project conditions:
 - J SS.C06.1 (involves **the rate or quantity** of stormwater)
 - J reduce the "C" value by 25%, capture 85% of the total runoff
 - J SS.C06.2 (involves **the treatment** of stormwater)
 - J remove 80% TSS and 40% TP of the post-project's annual nutrient loading

Challenging ‘New Development’ Requirements

- J 2001 Stormwater Charette involvement was key for receiving City’s approval for modifications
- J SB Co currently the most strict in stormwater regs in So. Cal.
- J IEUA saved ratepayers \$1,417,322 on stormwater project elements alone!
 - J Alternative paving materials
 - J No curb & gutter
 - J Storm drain size reduction
 - J Elimination of box culvert to Chino Creek

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2.0 LEEDTM Stormwater Requirements

Criteria SS.C06.1

- J No increase in net imperviousness of the project site – Pre-condition (dairy) vs post-condition (HQ)
- J Accomplishment
 - J The imperviousness percentage of the site was reduced from runoff coefficient $C=0.75$ to $C=0.56$

Criteria SS.C06.2

- J Removal of approximately 80% of the average annual post-project Total Suspended Solids (TSS) and 40% of the average annual post project Total Phosphorous (TP)
- J Accomplishment
 - J Removed 89% of the average annual post-project TSS and 40% of the average annual phosphorous*

NOTE:

For purposes of this study, the “pre-project” condition refers to the site’s condition prior to project construction (dairy). The “post-project” condition reflects project completion. (Theoretical value for phosphorous)



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Reduce On-site Runoff Coefficient



Infiltrate!

- J Pervious pavement
- J No curb & gutter
- J Swales
- J Detention basins
- J Perforated pipe (!) for storm drains

- J Conservation and creation of Natural Areas
- J Natural Drainage System



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Innovative Pervious Pavements v. Traditional Paving



Unit Pavers (Vehicular) = 11,890 Sq. ft



Porous concrete = 12,000 Sq. ft



Natural Gray Concrete (vehicular) = 34,976 Sq. ft



Precast Concrete Pavers (Pedestrian) = 11,077 Sq. ft



Decomposed granite = 29,760 Sq. ft



Asphalt = 89,239 Sq. ft

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No Curb/Gutter

- J Water sheet flows across the site allotting ample time for detention, infiltration, and retention
- J Encourages drainage as a design element - *textures and colors were used to delineate walkways, landscaping, parking aisles, and driveways*
- J Utilizes natural drainage
- J Reduces use of curbs saving \$252,200



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Swales

- J On and off site storm water is treated naturally via swales, wetlands, and native vegetation
- J Provide opportunity for runoff to naturally infiltrate
- J Easily integrated into site design
- J Reduces stormwater velocities
- J Swales enhance overall project aesthetics
- J No ponding within 24 hours after ALL 2004/05 rainy season events (*calls from the Architect to make sure it worked!*)



Detention Basins

- J Sized to detain a 25 year storm event on-site
- J Sized to detain water quality volume
- J Assisted in the prevention of downstream flooding (El Prado Rd)
- J Decreased pollutant loading
- J Assisted in ground water recharge
- J Encouraged natural resources and ecosystems



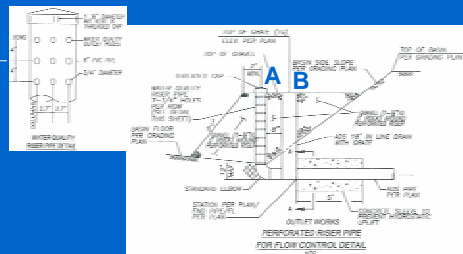
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Water Quality-Stormwater Treatment Perforated Piping System

The site has been graded to create an onsite retention basin with a capacity of approximately 76 acre-feet. It is estimated that the site could retain the 25-year storm event with a controlled release of 80 cfs.



Stormwater from roof drains and onsite surfaces are filtered and treated before entering the storm drain system



← All storm drain pipes on-site discharge into the channel and pond between the buildings. →



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Restoring the Natural Drainage

Engineered drainage system mimics natural systems

- Assumed a watershed perspective
- City of Chino SW Master Plan's 10'X10' box culvert to convey off-site flows to Chino Creek was eliminated (\$1.4 M savings !)
- Receives off-site storm flows previously directed from a 24" pipe into Chino Creek.

First seasonal storm event resulted in immediate improvements to the water quality of Chino Creek.



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Off-site Stormwater Capture



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BMP Parking Lot Savings

Design (see website)

- J Traditional Box culvert (\$1.2 M) Storm drains/ curb & gutter
- J Agency Operational cost savings - Car washing allowed on site – currently saving over \$18,000/ year . Potential of over \$140,000/year)

Other

- J Future savings to region Stormwater quality in Chino Creek/ SW runoff in City of Chino
- J Developer savings – paved way with the City

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Water Quality Empirical Data for Pollutant Removal (Assessment of BMP Effectiveness)

2004/05 Rainy Season Sampling

- J TSS was reduced by 89% (exceeding 80% required by LEED)
TM
- J Total Coliform was reduced by 95%
- J Fecal Coliform was reduced by 84%
- J 80% of the 30 constituents that were tested resulted in removals ranging from 74% up to 95%.
- J Traditional method would have dumped into Chino Creek over the next 20 years:
 - J Over 6 pounds of microbial bacteria, 1,600 pounds of oil & grease, 2,400 pounds of Nitrogen
 - J A total of two million pounds of organic and inorganic constituents

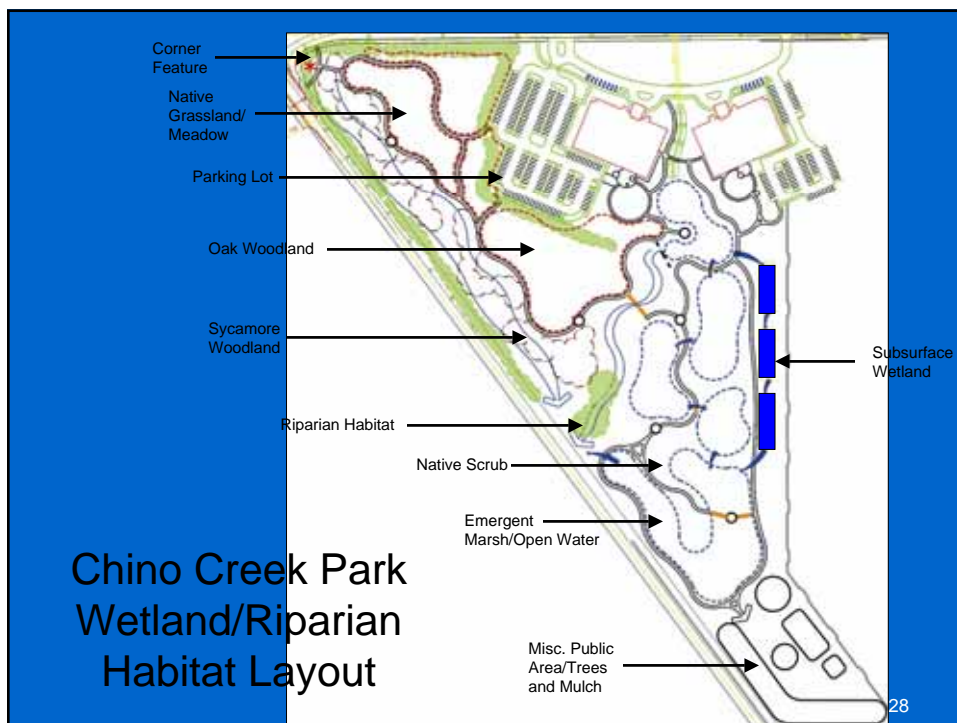
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Stormwater Design Conclusions

- Pre-planning is critical
- Concerns of critics need to be addressed (they may become your greatest supporter!)
- Some 'faith' is needed
- Drainage components can be used as a design element
- Environmentally sound landscaping and site design can be done cost effectively
- All savings (future) are not yet realized



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